DOGA®
ASSEMBLY TECHNOLOGY

Instruction manual

WIRELESS DC TOOL
COM Protocol MODBUS BM/BMT series

EN

60427-10/21

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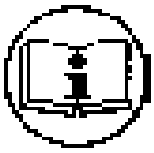
IMPORTANT

The tool delivered with this manual may have been modified for specific needs.
In that case, please give us the tool code number written on our shipping note or the approximate tool delivery date when you place an order for a new similar tool or for spare parts.
In that way, you will be sure to get the required tool and/or spare part.

WARNING



This information has to be kept in a location known by all users.

Each operator has to read carefully this manual before installing, using, and mending the product.

Be sure that the operator has understood using recommendations and the meaning of signs put on the product.

Most accidents could be avoided respecting this Manual Instructions. As a matter of fact, they were created according to European laws and norms regarding products.

In each case, please respect and follow safety national norms. Do not take off nor damage the stickers or advise put on the product and above all the details imposed by the law.

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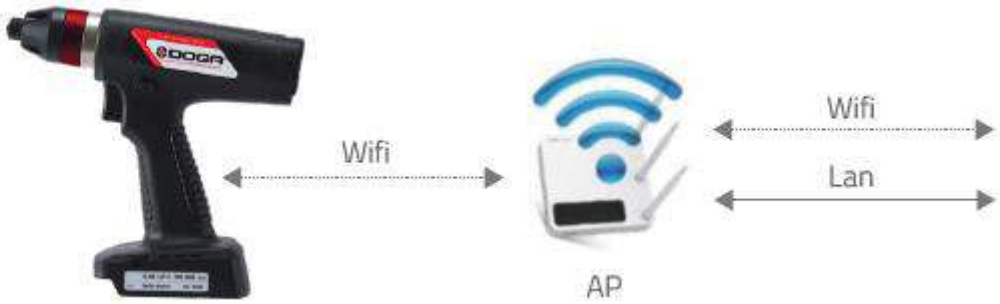
1. Overview and Communication Specifications

1.1 Overview

BM is capable of connecting to the host controller (Handy Loader, HMI, PLC, PC, etc.) through Wifi & ethernet, allowing the user to use such functions as parameter change and data monitoring.



AP : WiFi Access Point or Router 2.4GHz or 5GHz (not included)

2. Basic Structure of Communication Protocol MODBUS TCP

2.1 Modbus TCP Frame Format

Name	Length(byte)	Function
Transaction Identifier	2	For synchronization between messages of server & client
Protocol Identifier	2	Zero for Modbus/TCP
Length Field	2	Number of remaining bytes in this frame
Unit Identifier	1	Slave Address (use 0)
Function	1	Function codes as in other variants
Data	n	Data as response or commands

Format of Modbus/TCP frame is described in the below figure.

- byte 0 ~ 1: transaction ID (Transaction Identification)

This means the sequence number of queries and responses. While TCP operates as a master, it is incremented by one in every query (It doesn't matter if this field is set to 0x0000).

- byte 2 ~ 3: protocol ID (Protocol Identification)

This means the protocol identification and the value is fixed as 0x0000 for Modbus/TCP

- byte 4 ~ 5: length

The value of this means the number of bytes from next byte of length field to the end of the frame.

- byte 6: unit ID(Unit Identification)
- byte 7: FC (Function Code)
- byte 8~ : data depending on function code

Caution
A polling request should be sent to each BM/BMT tool every second to keep communication alive.

3. Function code & message details

Function code	Description	Remark
03 (0x03)	**Read** Holding Register	16bit data (Integer) ex) parameter
04 (0x04)	**Read** Input Register	16bit data ex) monitoring data
06 (0x06)	**Write** Single Register	16bit integer format ex) parameter data
17 (0x11)	**Request** Slave ID	

3.1 < READ > Function code 03 & 04 details

Function code 03 is used to read the register as like parameters (address 1 to 725)
Function code 04 is used to read the register as like alarm & monitoring data (address 3100 to 3399).
The only integer number is allowed.

[Query (Request)]

Slave address (00 for TCP)	Function Code	Start address High	Start address Low	No of address High	No of address Low

Function code consist of one byte. But start address and number of address are consisted by 2 bytes with 4 digits of hexadecimal, starting with first 2 digits for high number, second 2 digits for low number.

[OK Response]

Slave address (00 for TCP)	Function Code	No of byte	Data #1 High	Data #1 Low	... x n data

The number of data is consisted by 2 bytes with 4 digits of hexadecimal. So the total number of data is equal to 1/2 of the number of byte.

[Abnormal Respons]

Slave address (00 for TCP)	Function code +0x080	Error code

By adding 0x080 to the function code, it response any abnormal or wrong message

Example message of " 03 " for parameter data

To read the data of parameter 1 and 2, which is torque & speed value of Preset #1

(03 : Query)

Slave address (00 for TCP)	03	00	02	00	02

Start address : 2 (0002h)

Number of address : 2 (0002h)

Read data of two addresses starting from address #2

(03 : Response)

Slave address (00 for TCP)	Function Code	No of byte	Data #1 High	Data #1 Low	... x n data

Slave address (00 for TCP)	03	04	01	0F	03	21

Data value of 1st address : 010F (hex) = 271 (dec) ← torque value of Preset #1

Date value of 2nd address : 03E8(hex) = 1000 (dec) ← Torque limit value 10.00%

[Address for parameters]

Refer the appendix A for all address details for parameters

1 – 725 : Parameter address

(1001 – 1724 : Parameter value range MIN)

(2001 – 2724 : Parameter value range MAX)

Example message of " 04 " for fastening data

To read the fastening data which is renewed by the event such as start, stop, F/R rotation…

(04 : Query)

Slave address (00 for TCP)	04	0c	84	00	02

Start address : 3204 (0c84h)

Number of address : 2 (0002h)

Read data of two addresses starting from address #3204

(04 : Response)

Slave address (00 for TCP)	Function Code	No of byte	Data #1 High	Data #1 Low	... x n data

Slave address (00 for TCP)	04	04	01	0F	03	21

Data value of 1st address : 010Fh = 2.71 (dec) ← Converted torque value

Data value of 2nd address : 03E8h = 1000 (dec) ← Target speed

[Address for monitoring]

Refer the appendix A for all address details for monitoring

3100 – 3101 : Alarm data

3200 – 3213 : Data updated by event (Start, F/L, Preset change, Torque up)

3300 – 3313 : Real-time data

3.2 < WRITE > Function code 06 : writing parameters

Function code 06 is used to WRITE the parameter value in each register. The only integer number is allowed.

(Query)

Slave address (00 for TCP)	Function Code	Address High	Address Low	Date High	Data Low

(OK Response)

Slave address (00 for TCP)	Function Code	Address High	Address Low	Date High	Data Low

It provides the echo response on the query (request) after writing data in register.

- Refer the appendix A for all address details for writing.

4000 – 4005 : remote inputs (preset selection, remote start, driver lock, F/L, alarm reset)

Example message of " 06 " for Real-time monitoring data Auto output → ON

To read the renewed fastening data automatically and continuously, repeat the same query as below in every 10 seconds.

(06 : Query)

Slave address (00 for TCP)	06	0F	A2	00	01

Address : 4002 (0FA2h)

Data : 1 (0001h)

(06 : Response)

It response the same as the query

01	06	0F	A2	00	01

Once it write " 1 " on the address 4002, the real-time monitoring data is responsed with the function code "04" automatically when there is the event as like torque-up, F/R change, preset # change, etc.

Repeat the same query in every 10 seconds to keep the data output.

3.3 Auto data output – data description

Auto data output is same data format as the answer to a read request (code 04) of 14 register addresses 3200 to 3213 but sent spontaneously without read request when a new event occurs

Data description :

Data updated on events (Start, F/L, Preset, Torque up)	Event count no. (1- 65,535)	3200	Read : 0x04	
	Fastening time (ms)	3201	Read : 0x04	
	Preset no.	3202	Read : 0x04	
	Target torque (* x 100)	3203	Read : 0x04	[value: 4321] -> [mean: 43.21]
	Converted torque (* x 100)	3204	Read : 0x04	
	Target speed (rpm)	3205	Read : 0x04	
	A1 (degree)	3206	Read : 0x04	
	A2 (degree)	3207	Read : 0x04	
	A3 (degree)	3208	Read : 0x04	
	Screw count value	3209	Read : 0x04	
	Error	3210	Read : 0x04	
	Forward / Loosening	3211	Read : 0x04	0: Forward, 1: Loosening
	Status	3212	Read : 0x04	Other = 0, Fastening complete = 1, Fastening NG (E330,332,333,334,335,336,337,338,339)= 2, F/L change = 3, Preset change = 4, Alarm reset = 5, Error(except fastening NG) = 6 Barcode = 7 Screw count-1 = 8
	Snug torque angle (degree)	3213	Read : 0x04	

Event generating an auto data output for any of the following status :

0 = Other
1 = Fastening complete
2 = Fastening NG (E330,332,333,334,335,336,337,338,339)
3 = F/L change
4 = Preset change
5 = Alarm reset
6 = Error(except fastening NG)
7 = Barcode (not implemented)
8 = Screw count-1

Example of auto data output frame:

Auto data frame explanation:

00 01 : transmission ID
00 00 : protocol ID
00 1F : length in bytes (31 in bytes)
00 : unit
04 : modbus function code (read)
1C: number of bytes (28 in dec)
00 …. : data registers 3200 to 3213

3.4 < REQUEST > Function code 17 : Slave device information

Function code 17 is used to read the slave device information about ID no, controller model, screwdriver model, serial no and firmware version.

Information
This request can be used for keep alive polling with tool.
Suggested frequency : 1 second

(Query)

Slave address (00 for TCP)	Function Code (17)	CRC (RTU) Low	CRC (RTU) High

(Response)

Slave address (00 for TCP)	Function Code	No. of byte	ID High	ID Low	Controller model High	Controller model Low	Screw driver model High	Screw driver model Low	Ver. High	Ver. Low	S/N 4	S/N 3	S/N 2	S/N 1	CRC (RTU) Low	CRC (RTU) High

BM

Value	Model
0	Unknown
1	3201
2	3202
3	3204
4	3206
5	3211
6	3216
7	3224
8	3236
9	3245
10	3264

BMT

Value	Model
0	Unknown
1	3201
2	3202
3	3204
4	3206
5	3211
6	3216
7	3224
8	3236
9	3245
10	3264
11	3280

Software version (controller firmware version)

Version = (Version high << 8) + (Version low)

Serial no (driver serial number)

Serial no = (sn4 << 24) + (sn3 << 16) + (sn2 << 8) + sn1

3.5 Error code for abnormal response

If there are wrong function code or communication failure by protocol (parity, LRC, CRC..etc.), there will be no response. The master will show " TIME OUT " error.

If the query contains wrong function code or address, the function code + 0x80 will be responsed together with the following error code in data registry.

Error code	Description
0x01	No defined function code or wrong function code
0x02	Wrong address or no existing address
0x03	Data length over the capacity
0x07	Wrong CRC value in query
0x0C	Over the number of byte
0x0E	Range of data is not available

Example message

To read the 5 parameter data starting from 564 to 568

(01 : Query)

Slave address (00 for TCP)	01	02	34	00	05

Start address : 564 (0234h), Number of address : 5 (0005h)

Function code 01 is not defined. → Function code error

Parameter from 564 to 568 are not existing. → No existing address

(01 + 80 : Response)

Slave address (00 for TCP)	81	02

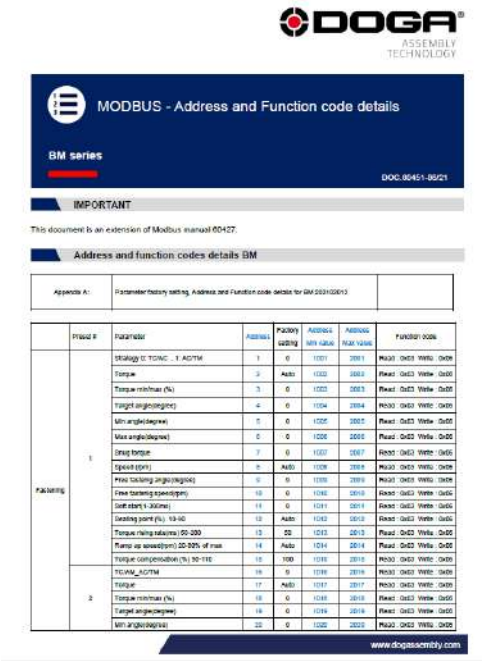
Function code (01) + 0x80 = **81**

Error code for wrong data address = 02

4. Appendix A

4.1 Parameter factory setting, Address and Function code details for BM

Please refer 60451 datasheet



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MODBUS - Address and Function code details

BM series

DOC.60451-09/21

IMPORTANT

This document is an extension of Modbus manual 60427.

Address and function codes details BM

Appendix A:	Parameter factory setting, Address and Function code details for BM 2021/09/13	

	Preset #	Parameter	Address	Factory setting	Address MIN value	Address MAX value	Function code
Fastening	1	Strategy 0: TOAC ... 1: AO/TM	1	0	1001	2001	Read : 0x03 Write : 0x06
		Torque	2	Auto	1002	2002	Read : 0x03 Write : 0x06
		Torque min/max (%)	3	0	1003	2003	Read : 0x03 Write : 0x06
		Target angle(degree)	4	0	1004	2004	Read : 0x03 Write : 0x06
		Min angle(degree)	5	0	1005	2005	Read : 0x03 Write : 0x06
		Max angle(degree)	6	0	1006	2006	Read : 0x03 Write : 0x06
		Drag torque	7	0	1007	2007	Read : 0x03 Write : 0x06
		Speed (rpm)	8	Auto	1008	2008	Read : 0x03 Write : 0x06
		Free fastening angle(degree)	9	0	1009	2009	Read : 0x03 Write : 0x06
		Free fastening speed(rpm)	10	0	1010	2010	Read : 0x03 Write : 0x06
		Soft start(1-300ms)	11	0	1011	2011	Read : 0x03 Write : 0x06
		Seating point (%) 10-90	12	Auto	1012	2012	Read : 0x03 Write : 0x06
		Torque rising rate(ms) 50-200	13	50	1013	2013	Read : 0x03 Write : 0x06
		Ramp up speed(rpm) 20-80% of max	14	Auto	1014	2014	Read : 0x03 Write : 0x06
		Torque compensation (%) 50-110	15	100	1015	2015	Read : 0x03 Write : 0x06
	2	TOAM_AOTM	16	0	1016	2016	Read : 0x03 Write : 0x06
		Torque	17	Auto	1017	2017	Read : 0x03 Write : 0x06
		Torque min/max (%)	18	0	1018	2018	Read : 0x03 Write : 0x06
		Target angle(degree)	19	0	1019	2019	Read : 0x03 Write : 0x06
		Min angle(degree)	20	0	1020	2020	Read : 0x03 Write : 0x06

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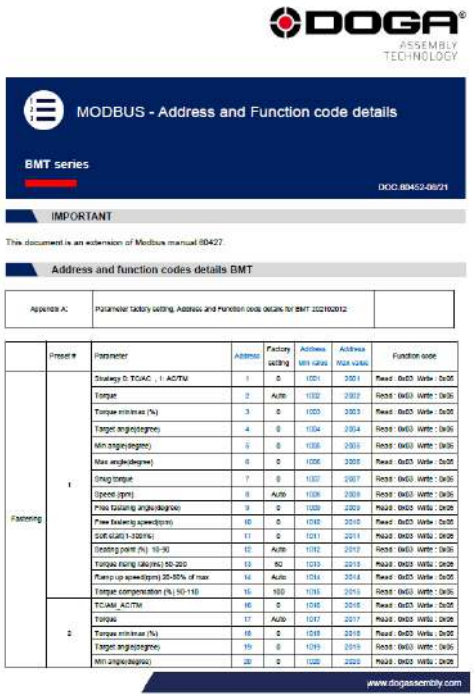
4.2 Parameter factory setting, Address and Function code details for BMT

Please refer 60452 datasheet



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MODBUS - Address and Function code details

BMT series

DOC.60452-09/21

IMPORTANT

This document is an extension of Modbus manual 60427.

Address and function codes details BMT

Appendix A:	Parameter factory setting, Address and Function code details for BMT 2021/09/13	

	Preset #	Parameter	Address	Factory setting	Address MIN value	Address MAX value	Function code
Fastening	1	Strategy 0: TOAC ... 1: AO/TM	1	0	1001	2001	Read : 0x03 Write : 0x06
		Torque	2	Auto	1002	2002	Read : 0x03 Write : 0x06
		Torque min/max (%)	3	0	1003	2003	Read : 0x03 Write : 0x06
		Target angle(degree)	4	0	1004	2004	Read : 0x03 Write : 0x06
		Min angle(degree)	5	0	1005	2005	Read : 0x03 Write : 0x06
		Max angle(degree)	6	0	1006	2006	Read : 0x03 Write : 0x06
		Drag torque	7	0	1007	2007	Read : 0x03 Write : 0x06
		Speed (rpm)	8	Auto	1008	2008	Read : 0x03 Write : 0x06
		Free fastening angle(degree)	9	0	1009	2009	Read : 0x03 Write : 0x06
		Free fastening speed(rpm)	10	0	1010	2010	Read : 0x03 Write : 0x06
		Soft start(1-300ms)	11	0	1011	2011	Read : 0x03 Write : 0x06
		Seating point (%) 10-90	12	Auto	1012	2012	Read : 0x03 Write : 0x06
		Torque rising rate(ms) 50-200	13	50	1013	2013	Read : 0x03 Write : 0x06
		Ramp up speed(rpm) 20-80% of max	14	Auto	1014	2014	Read : 0x03 Write : 0x06
		Torque compensation (%) 50-110	15	100	1015	2015	Read : 0x03 Write : 0x06
	2	TOAM_AOTM	16	0	1016	2016	Read : 0x03 Write : 0x06
		Torque	17	Auto	1017	2017	Read : 0x03 Write : 0x06
		Torque min/max (%)	18	0	1018	2018	Read : 0x03 Write : 0x06
		Target angle(degree)	19	0	1019	2019	Read : 0x03 Write : 0x06
		Min angle(degree)	20	0	1020	2020	Read : 0x03 Write : 0x06

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